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Butterfly fauna of protected areas in North and central Vietnam; collections 1994-1997

(Lepidoptera, Rhopalocera)

by

M. J. Hill & A. L. Monastyrskii

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Abstract: This paper discusses butterfly records for Vietnam, from collections made in protected areas of the North and central regions of the country between 1994 and 1997. 384 species are identified, including at least 28 taxa previously unrecorded in Vietnam and two taxa new to science. The dominant natural vegetation type of the study sites was forest, and a number of restricted-range forest species were collected. It is likely that some of these species are endangered within Vietnam, but at present there is insufficient data to recognise threatened taxa or draw conclusions on the status of any but the most common species.

Introduction

The butterfly fauna of the South-East Asian region has been relatively well-studied, with major identification works published for Thailand (Pinratana, 1979-92), Malaysia (Corbet & Pendlebury, 1992), and the Oriental region as a whole (D'Abrera, 1982-86). In addition, there are a number of detailed works, often dealing with individual taxonomic groups, including Evans (1932, 1949), Lee (1962), Aoki & Uemura (1982, 1984; Satyridae), Aoki & Yamaguchi (1984; Satyridae), Shirozu & Yata (1973; Pieridae). However, fieldwork on butterflies in the region has been concentrated in certain areas (notably Thailand and the Malay Peninsula), and relatively little is known about the butterflies of Vietnam.

The first attempt to produce a comprehensive list of the Lepidoptera of Indochina (Vietnam, Laos and Cambodia) was published in 1919 (Vitalis de Salvaza, 1919), a work which included 611 butterfly species. Major collections of butterflies were made in the mid twentieth century, and a preliminary checklist of 455 butterfly species in Vietnam was published in 1957 (Metaye, 1957). More recent work has been carried out by a team from the Czech Academy of Sciences, who have conducted studies of butterfly ecology in Tam Dao National Park near Hanoi (Leps & Spitzer, 1990; Novotny et al., 1991; Spitzer et al., 1993; Spitzer & Jaros, 1996) and other sites (Spitzer et al., 1987). In addition, butterfly specimens have been collected from several sites by the Vietnam-Russia Tropical Centre, Hanoi (Monastyrskii et al., 1995; Monastyrskii & Dang Thi Dap, 1996), and by the Frontier Vietnam Forest Research Programme (VFRP), which has conducted biodiversity surveys in a range of nature reserves and national parks in the northern and central regions of Vietnam. Since 1994, biodiversity surveys including butterfly collection have been carried out in seven protected areas by VFRP; this paper summarises the results of this work, and describes records of interest.

Study sites: general

The seven survey sites at which collections were made are shown in Figure 1, and some characteristics of the study sites are shown in the table, Figure 2.

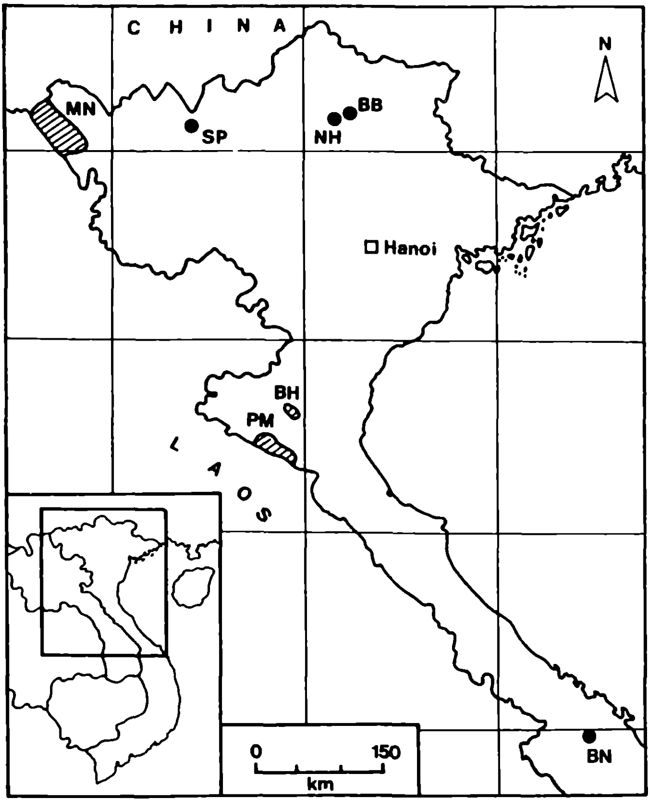

Fig. 1: position of survey sites.

Figure 2: Some characteristics of the sites studied.

Site	Province	Status*	Coordinates	Area (ha)	Altitude (m)	Dates studied
Pu Mat	Nghe An	NR	104° 20' E 19° 10' N 104° 55' E 18° 50' N	93,400	400-1,841	X-XII.1994
Sa Pa (Hoang Lien Son)	Lao Cai	NR	103° 47' E 22° 09' N 103° 59' E 23° 24' N	29,831	1,000-3,142	IV-VI.1994 I-III.1995
Bu Huong	Nghe An	NR	104° 45' E 19° 30' N 105° 00' E 19° 15' N	49,000	400-1,580	IV-VI.1995
Ba Na	Quang Nam-Da Nang	NR	107° 57' E 15° 57' N 108° 03' E 16° 03' N	5,217	300-1,440	VII-IX1995
Na Hang	Tuyen Quang	NR	105° 22' E 22° 16' N 105° 29' E 22° 31' N	21,725	100-1,082	I-III.1996 VII-IX.1996
Ba Be	Cao Bang	NP	105° 37' E 22° 23' N	7,696	145-1,098	X-XII.1996
Muong Nhe	Lai Chau	NR	102° 10' E 22° 00' N 102° 45' E 22° 26' N	182,000	500-1,948	I-III.1997

* NP = National park; NR = Nature reserve

Study sites: vegetation

Forest vegetation types were dominant in the protected areas studied, with the exception of Muong Nhe, where less than 30% of the land area was classified as forest in 1992 (Cox et al., 1992). The forests of the study areas can be divided into four main formations (WWF/IUCN, 1995):

1) Tropical wet evergreen and semi-evergreen forests. In lowlands (<700 m altitude), with high annual rainfall (>1,500 mm). Restricted to the centre and South of Vietnam, and (of the sites visited) only important at Ba Na, Pu Mat and Bu Huong;

2) Tropical moist deciduous and semi-deciduous monsoon forests. In lowlands with lower rainfall (<1,500 mm annually). Present in much of North Vietnam, including Ba Be, Na Hang, Pu Mat and Bu Huong. Formerly the dominant vegetation of Muong Nhe Nature Reserve (Cox et al., 1992);

3) Limestone forest. Lowland forest growing on limestone; rich in endemic herbs (WWF/IUCN, 1995). The dominant vegetation type of Na Hang and Ba Be;

4) High-altitude forests. Lower Montane forests occur at 700–1,800 m, Upper Montane forests above 1,800 m. Present at most of the sites studied (with the exception of Muong Nhe), and the dominant vegetation at Hoang Lien Son Nature Reserve, Sa Pa.

The distribution of these forest types depends upon a combination of climatic factors (particularly rainfall), altitude and geology, together with biotic and anthropogenic factors. Human influences have also encouraged a range of semi-natural and intensively managed vegetation types, including:

1) Savanna grassland. Dominated by the grass Imperata cylindrica, with other grass species and perennial herbs, often with scattered trees. The major vegetation type of Muong Nhe Nature Reserve;

2) Scrub. Woody regrowth, often dominated by shrubs and treelets of the families Euphorbiaceae (including *Mallotus* and *Macaranga* spp.), Rosaceae (e.g. *Rubus* spp.). Present in all sites;

3) Arable land. All of the areas studied have a resident human population, with cultivation of paddy and upland rice, maize and cassava (the latter crops cultivated on slopes using rotational fallow methods, particularly by members of ethnic minority communities). Arable ecosystems are particularly important at Muong Nhe and Sa Pa, where there are large human populations.

Methods

In each of the study areas, butterfly collection was carried out as part of a three-month survey of biodiversity. Butterfly collection occurred on one-kilometer transects walked at least once a week; at each site, three transects were established, one each in forest, scrub, and arable land or grassland. Butterflies were also collected opportunistically throughout the reserve, in a variety of habitats. In order to catch upper-canopy species, butterfly traps (as described by

AUSTIN & RILEY, 1995) were used. These were suspended from trees in forest-edge habitats, with ripe fruit as bait.

Preliminary butterfly identification in the field was carried out using LEKAGUL et al. (1977). Species that could not be recognised were identified to "Recognisible Taxonomic Units" (RTUs). More detailed identification work was carried out by A. L. MONASTYRSKII. Hesperiidae, Satyridae and Pieridae from certain sites were identified by A. L. DEVYATKIN (Moscow University, Russia), Y. UEMURA (Toyosato Museum of Entomology, Japan), and O. YATA (Kyushu University 1, Japan), respectively. Although species of the family Lycaenidae have been identified, some specimens are in need of detailed taxonomic confirmation.

While a range of subspecies and forms are recognised for many of the species observed, there is insufficient information on the identification and distribution of butterfly subspecies in northern and central Vietnam to be sure of subspecific determination. Therefore, for most of the species listed in Appendix 1, subspecific names are omitted.

Information on the worldwide geographic distribution for each species collected was derived from previous works on Vietnamese butterflies (LEPS & SPITZER, 1990; SPITZER et al, 1993), and those of the Indo-Malayan region (LEKAGUL et al., 1977; CORBET & PENDLEBURY, 1992; D'ABRERA, 1979-96). The families Lycaenidae and Hesperiidae were excluded from this analysis, as distributional data is incomplete for these families. Six distribution classes were recognised (adapted from those of SPITZER et al., 1993), from the most restricted to the most widespread:

1) Endemic (E. Himalayas, S. China, N. Indochina);
2) Mainland South-East Asia;
3) Entire Indo-Malayan region;
4a) Indo-Malayan and Australasian regions;
4b) Palaearctic, extending into Indo-Malayan region;
5a) Old-world tropics;
5b) Holarctic, extending into Indo-Malayan region;
6) Cosmopolitan.

In reality, category 1 is ill-defined, as the distributions of butterflies in Vietnam, Laos and southern China are not fully known, but the category is retained as category 1 species are those with the most restricted range. For certain taxa (particularly, some of the Satyridae), there is insufficient existing information to estimate the species distribution.

Results

A list of species caught in the seven sites is shown in Appendix 1, together with their global distribution. The family structure, nomenclature, and generic order followed in this list are approximately those of PINRATANA (1979-96), with variations incorporated from more recent works.

Overall, 384 species, from 11 families, were collected. The number of species collected in each family is shown in Figure 3. In Figure 4, the composition of each fauna by biogeographical range is shown. Figure 5 shows the relative proportions of four butterfly assemblages (Sa Pa, Ba Be, Bu Huong, and Ba Na) made up of primarily northern (Palaearctic/Holarctic) species, and those of the Indomalayan region.

The biogeographical composition of each assemblage is broadly similar, with the majority of species restricted to the Indo-Malayan (Oriental) region. However, Sa Pa had a particularly high proportion of its fauna made up of typically Palaearctic or Holarctic species, in comparison to sites at lower altitude (Ba Be) and further South in Vietnam (Bu Huong, Ba Na; see fig. 5). In contrast, species restricted to Indochina and South China are most important at Na Hang, Pu Mat and Bu Huong; these are the sites with the most extensive areas of remaining rain forest. There is a significant association ($\chi^2_{(8)} = 16.157$; $0.05>p>0.01$) between the world range and number of sites at which species were caught in the current study; in general, the more widespread a species globally, the greater the number of sites in Vietnam in which it was caught.

Attempts to associate physical closeness of sites and faunal similarity are complicated by a number of factors such as seasonality and the proportion of the total fauna collected at each site. Seasonality might be expected to have a major effect on the butterflies (LEPS & SPITZER, 1990), particularly forest butterflies such as the amathusiid *Stichopthalma louisa* (NOVOTNY et al., 1991). In most of the study sites, collection was only made during one three-month period. Seasonal effects may explain the relatively high degree of similarity between the sites Ba Na and Ba Be, geographically quite distinct. In both of these sites, collection occurred in late summer, and a large species list was produced (suggesting that a high proportion of the taxa present were collected).

While seasonality and collecting efficiency influence the apparent similarity of sites, habitat variation between sites is also an important factor; certain species, including many of the Amathusiidae, and Satyridae such as *Lethe gemina* and *Mandarinia regalis*, appear to be restricted to undisturbed forest habitats (LEPS & SPITZER, 1990). In addition, butterflies (like other insects) show annual fluctuations in abundance; for example, *Papilio dialis doddsi* (Papilionidae), abundant at Ba Vi Nature Reserve, Vietnam, in 1997, was virtually absent in 1996. Migration adds to population fluctuations for species such as *Catopsilia pomona* (Pieridae) and *Danaus chrysippus* (Danaidae) (SPITZER et al., 1987), although little is known of butterfly migration patterns in Vietnam. Only long-term collection (over several seasons) can ensure complete representation of the fauna of a single site.

However, despite these reservations, the list given in Appendix 1 contains a number of interesting records, of species previously unknown in Vietnam, or found well outside their previously known ranges. These are discussed below.

1) New species

Two new species were collected in the course of the study; to date, only one of these has been described.

Ypthima spec. nov. (Satyridae); this species, caught in Sa Pa, has yet to be described (UEMURA & MONASTYRSKII, in prep.).

Thoressa monastyrskyi (Hesperiidae); the species was described in 1996 from material collected at Tam Dao National Park by A. MONASTYRSKII (DEVYATKIN, 1996); specimens collected in Bu Huong form paratypes.

Halpe ?spec. nov. (Hesperiidae); material collected at Muong Nhe may represent a new species (DEVYATKIN, pers. comm.).

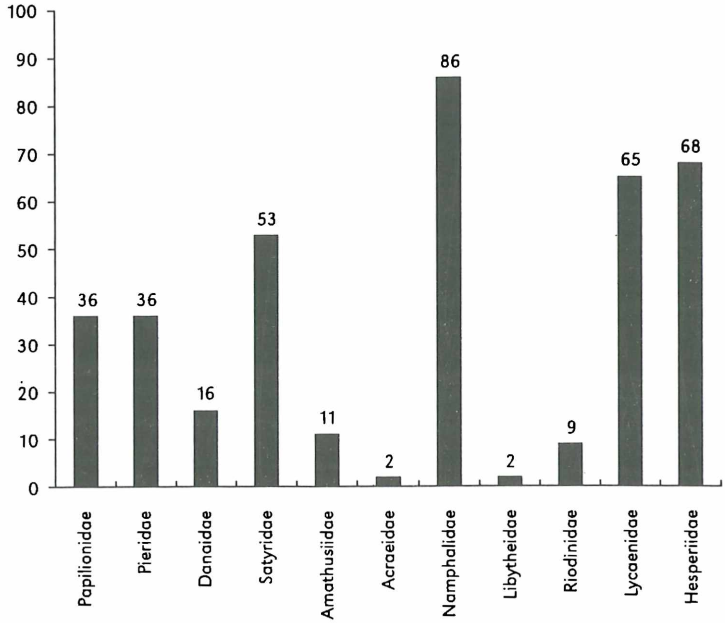

Fig. 3: Number of species in each family.

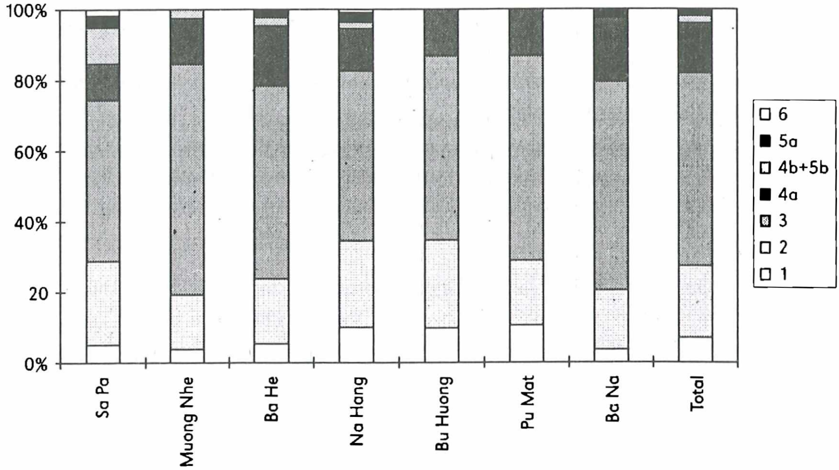

Fig. 4: Composition of the butterfly fauna at seven sites, by world ranges (excludes Lycaenidae and Hesperiidae).

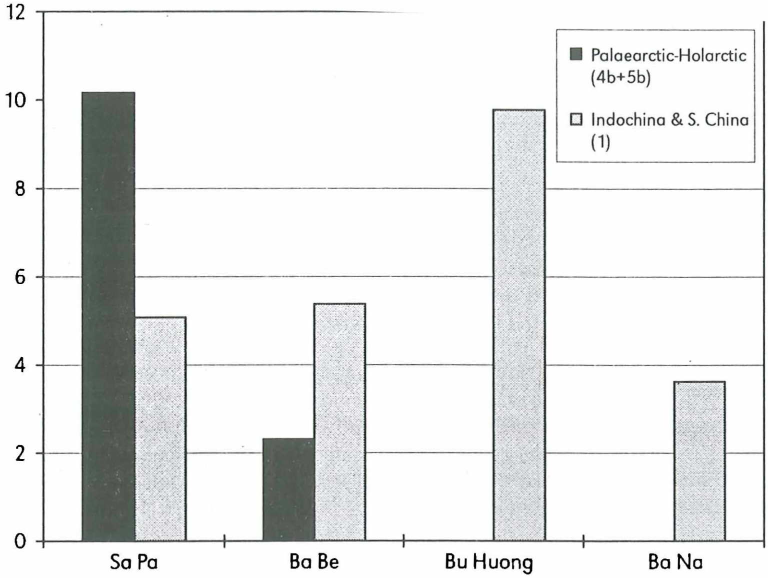

Fig. 5: Percentage of the species assemblage made up of Palaearctic/Holarctic species (4b and 5b), and restricted-range species (1) at four sites.

2) New records for Vietnam

Twenty-eight of the species recorded are not listed from Vietnam in previous literature, and appear to be new records for Vietnam, including;

Graphium glycerion Gray, 1831 (Papilionidae; fig. 6), collected at Sa Pa. The known range extends from Nepal to North Burma (D'Abrera, 1982).

Pontia daplidice Linnaeus, 1758 (Pieridae); from Sa Pa and Muong Nhe. This species is not listed in works by Vitalis de Salvaza (1919) or Metaye (1957).

Ypthima nebulosa Aoki & Uemura, 1982 (Satyridae).

Ypthima tappana Matsumura, 1909 (Satyridae). Identified as a new species for Vietnam by Y. Uemura; previously known for Taiwan and Hainan.

Ypthima sakra Moore, 1858 (Satyridae). Identified as a new species for Vietnam by Y. Uemura.

Zipaetis unipupillata Lee, 1962 (Satyridae); described in 1962 from Yunnan, China (Lee, 1962), this butterfly was abundant at Na Hang and Ba Be where it appeared to favour bamboo groves.

In addition, twenty-two species of Hesperiidae were identified as new records for Vietnam, by A. Devyatkin (see Appendix 1).

One subspecific form was identified as new to Vietnam:

Lethe gemina yao (Satyridae); although *L. gemina* itself is known from Vietnam, the subspecies *L. g. yao*, which was described from Southern China (SUGIYAMA, 1996), has been identified in material from Bu Huong (UEMURA, pers. comm.).

3) Range extensions

Some of the species taken were found in only the northern, or southern sites studied. Thus the acraeid *Acraea violae* was found only in the southernmost study site, Ba Na in central Vietnam (the range of this species is given as southern Vietnam in METAYE, 1957). In contrast, in this study, A. issoria was restricted to sites in the North.

A group of species including the papilionid *Graphium glycerion*, pierids *Pontia daplidice, Pieris brassicae, Colias fieldi* (fig. 7), *Dercas nina* (fig. 8) and *Aporia agathon*, nymphalids *Childrena childreni* and *Auzakia danava*, and satyrids *Neope pulaha* and *Ypthima sakra*, were found only at Sa Pa (some also in Muong Nhe). Sa Pa is unique in its physical position and altitude and therefore supports a range of species whose distribution is northern (Sino-Himalayan and Palaearctic) rather than Indo-Malayan (Oriental).

Some species were observed outside their known ranges, as recorded in previous works on the Lepidoptera of Vietnam. These included:

Gandaca harina (Pieridae); distribution given by METAYE (1957) as central; this species was collected in Sa Pa and Ba Be in the North of Vietnam.

Polyura jalysus (Nymphalidae); distribution given by METAYE (1957) as northern; collected in Ba Na, central Vietnam.

4) Restricted-range species and forest indicators

Several of the species collected appear to have a restricted range in Vietnam, or are only found in forest habitats. In many cases, species associated with forest show a more restricted geographic range than those of ruderal habitats (LEPS & SPITZER, 1990; SPITZER et al., 1993). Among the families Satyridae and Amathusiidae in particular, a high proportion of species are restricted to Indochina and southern China; many of these butterflies are forest understorey species, such as the genera *Stichophthalma* and *Faunis* (Amathusiidae), some *Lethe* species (including *L. gemina*; fig. 9), and *Mandarinia regalis* (Satyridae) (LEPS & SPITZER, 1990; SPITZER et al., 1993).

Two more widespread species which are restricted to forest habitats are the nymphalids *Rhinopalpa polynice* and *Prothoe franck* (LEKAGUL et al., 1977).

Rhinopalpa polynice (fig. 10) appears to be restricted to undisturbed (often primary) forest, and in the present survey, was only collected at Bu Huong and Pu Mat. Both of these sites, in the mountains of central Vietnam, retain some important areas of pristine rain forest with a high conservation value (KEMP et al., 1995; KEMP & DILGER, 1996). *Prothoe franck* (fig. 11) was only caught at Bu Huong.

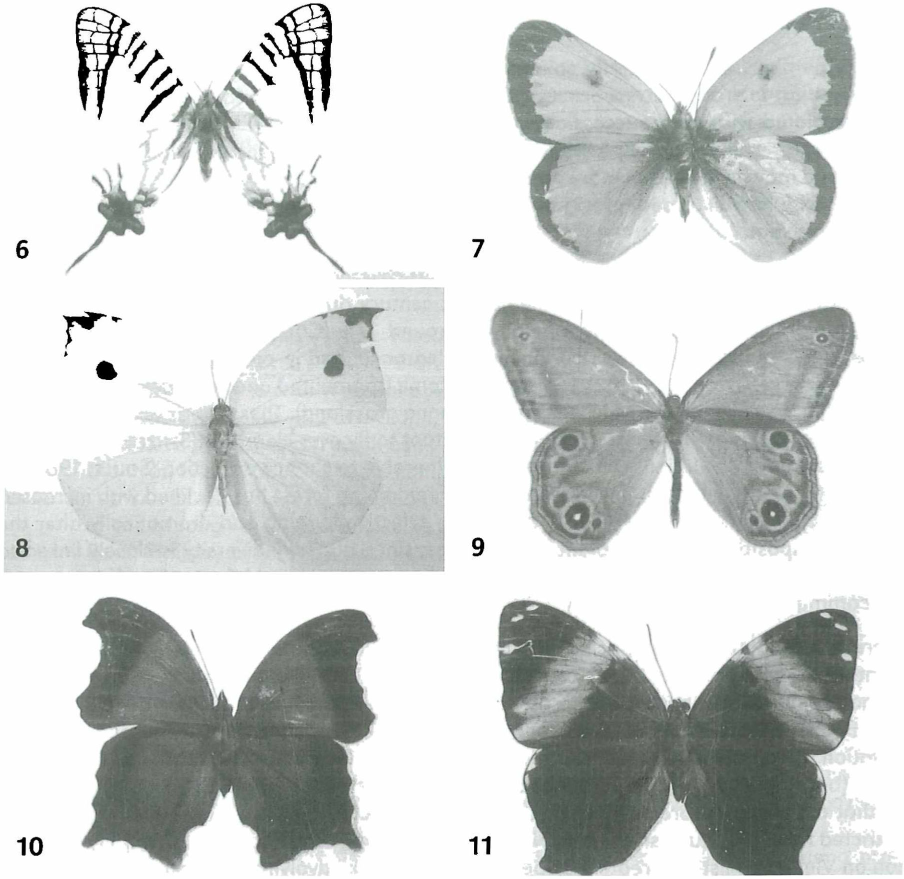

Fig. 6–11: photographs of Lepidoptera from Vietnam
6 – *Graphium glycerion* (Papilionidae); 7 – *Colias fieldi* (Pieridae); 8 – *Dercas nina* (Pieridae); 9 – *Lethe geminata* (Satyridae); 10 – *Rhinopalpa polynice* (Nymphalidae); 11 – *Prothoe franck* (Nymphalidae).

Discussion and Conclusions

Overall, a large collection was made, comparable in diversity to those made in the 1950s by METAYE (METAYE, 1957). However, it is likely that certain groups (especially the Lycaenidae and Hesperiidae) remain under-represented in the list presented in Appendix 1. While collections of these smaller, more difficult families were extensive at certain sites (Ba Be, Muong Nhe), at others (such as Pu Mat) they were neglected. The Lycaenidae in particular are in need of dedicated collection work in a number of sites in Vietnam to further elucidate species distribution and status.

A large number of the butterfly species collected are wide-ranging, common species with broad habitat tolerance; Leps & Spitzer (1990) noted that widely distributed species are generally associated with early-successional, disturbed habitats. However, several of the species recorded in the current survey have more restricted distributions and specific habitat requirements, and may be in need of more detailed conservation evaluation. These are the species associated with less-disturbed forest habitats, such as *Rhinopalpa polynice, Prothoe franck* and *Mandarinia regalis*.

Historically, the rain forest habitats of these species covered much of Vietnam's land area, but forest cover has declined rapidly in the current century due to warfare and the effects of a large, rapidly expanding rural population, to around 17% (Collins et al., 1991). All the protected areas studied continue to suffer forest clearance, and in places (such as Muong Nhe Nature Reserve; Cox et al., 1992), forest has become fragmented and separated by non-forest habitats (in the case of Muong Nhe, largely savanna grassland). These areas act as barriers to the dispersal of forest understorey species reluctant to fly over clearings (Spitzer et al., 1993), and the isolated populations thus formed are vulnerable to chance extinction (Soule, 1987). In addition to the loss of forest cover, the quality of remaining forest has declined with increased disturbance (Collins et al., 1991). In particular, selective logging can dramatically alter the species composition of woody plant communities; since butterfly diversity is closely linked to that of woody plants (Spitzer et al., 1987), such changes can have higher-order effects on animal communities.

At present, no butterflies are included in the Red Data Book for Vietnam (RDB, 1992), but this situation probably reflects a lack of study of this insect group rather than the true status of Vietnamese butterfly species. In Threatened Swallowtail Butterflies of the world: an IUCN Red Data Book (Collins & Morris, 1985), only four Vietnamese papilionids are regarded as of conservation concern; *Troides* spp. (two species in Vietnam), *Atrophaneura crassipes* and *Papilio noblei* (both listed as data deficient species, in need of further monitoring). In reality, it is possible that a number of forest-dependent species, restricted-range and Sino-Himalayan species restricted to high-altitude sites in the North of the country (particularly Sa Pa) qualify for inclusion on Vietnam's list of threatened species. Further work, involving both extensive and intensive collection at sites throughout the country, is needed to identify the taxa most at risk.

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Appendix 1: List of butterfly species from northern and central Vietnam

gd = geographic distribution; 1 (local) to 6 (cosmopolitan; see above).
– = insufficient data available on species distribution to assign to categories 1 to 6.
Season: 1 = January-March; 2 = April-June; 3 = July-September; 4 = October-December.
nV = New species for Vietnam (see text).

	Site		PM	SP 1	SP 2	BH	BN	NH 1	NH 2	BB	MN
	Year		94	94	95	95	95	96	96	96	97
	Season		4	2	1	2	3	1	3	4	1
		gd									
	Papilionidae										
1	*Troides aeacus* C. & R. Felder, 1860	2				*					
2	*Troides helena* Linnaeus, 1758	3						*	*		
3	*Atrophaneura crassipes* Oberthür, 1879	2								*	
4	*Atrophaneura dasarada* Moore, 1857	2						*			
5	*Atrophaneura polyeuctes* Doubleday, 1842	2			*						
6	*Atrophaneura varuna* White, 1842	2					*				
7	*Atrophaneura zaleucus* Hewitson, 1865	1									*
8	*Pachliopta aristolochiae* Fabricius, 1775	3	*	*			*				
9	*Chilasa clytia* Linnaeus, 1758	3					*				*
10	*Chilasa epycides* Hewitson, 1862	2		*							
11	*Chilasa slateri* Hewitson, 1859	3				*		*			
12	*Papilio alcmenor* Westwood, 1841	2	*			*			*		
13	*Papilio bianor* Cramer, 1776	2		*						*	
14	*Papilio castor* Westwood, 1842	1							*	*	
15	*Papilio demoleus* Linnaeus, 1758	4a					*		*		
16	*Papilio dialis doddsi* Leech, 1893	1				*					
17	*Papilio helenus* Linnaeus, 1758	4a	*	*		*	*	*	*	*	*
18	*Papilio memnon* Linnaeus, 1758	3	*			*	*	*	*	*	*
19	*Papilio nephelus* Boisduval, 1836	3				*	*		*	*	
20	*Papilio noblei* de Niceville, 1889	1					*				
21	*Papilio paris* Linnaeus, 1758	3	*	*		*	*	*	*	*	*
22	*Papilio polytes* Linnaeus, 1758	3					*		*		*
23	*Papilio polyctor* Boisduval, 1836	2				*		*			
24	*Papilio protenor* Cramer, 1775	2	*	*		*	*	*		*	
25	*Meandrusa payeni* Boisduval, 1836	4a				*					
26	*Graphium agamemnon* Linnaeus, 1758	4a	*	*		*	*			*	
27	*Graphium agetes* Westwood, 1843	3		*							
28	*Graphium chironides* Honrath, 1884	3				*					

	Site		PM	SP 1	SP 2	BH	BN	NH 1	NH 2	BB	MN
	Year		94	94	95	95	95	96	96	96	97
	Season		4	2	1	2	3	1	3	4	1
		gd									
29	*Graphium doson* C. & R. Felder, 1864	3				*	*		*		
30	*Graphium eurypylus* Linnaeus, 1758	4a				*			*	*	
31	*Graphium glycerion* Gray, 1831 nV	2			*						
32	*Graphium macareus* Godart, 1819	3				*					
33	*Graphium sarpedon* Linnaeus, 1758	4a	*			*	*	*		*	*
34	*Pathisa antiphates* Cramer, 1775	3				*	*		*	*	
35	*Lamproptera curius* Fabricius, 1787	3	*			*	*	*			
36	*Lamproptera meges* Zincken, 1831	3					*		*	*	*
	Pieridae										
37	*Delias acalis* Godart, 1819	2						*			
38	*Delias belladonna* Fabricius, 1793	3			*						
39	*Delias hyparete* Linnaeus, 1758	3			*					*	*
40	*Delias pasithoe* Linnaeus, 1767	2	*	*		*			*	*	*
41	*Aporia agathon* Gray, 1831	2		*							
42	*Prioneris philonome* Boisduval, 1836	3	*			*	*				
43	*Prioneris thestylis* Doubleday, 1842	2				*		*			
44	*Pieris brassicae nepalensis* Doubleday, 1846	4b			*						
45	*Pieris canidia* Sparrman, 1947	3	*	*	*	*		*	*	*	*
46	*Pieris erute erute* Poujade, 1888	4b									*
47	*Pieris rapae* Linnaeus, 1758	4b		*							
48	*Pontia daplidice* Linnaeus, 1758 nV	4b		*							*
49	*Cepora nadina* Lucas, 1852	3	*			*	*			*	
50	*Cepora nerissa* Fabricius, 1775	3								*	*
51	*Appias albina* Boisduval, 1836	3		*		*	*		*	*	
52	*Appias indra* Moore, 1857	2	*	*		*			*		
53	*Appias libythea olferna* Swinhoe, 1890	3					*				
54	*Appias lyncida* Cramer, 1777	3	*	*		*	*		*	*	*
55	*Appias nero* Fabricius, 1793	3				*			*	*	
56	*Appias paulina* Cramer, 1777	4a								*	
57	*Ixias pyrene* Linnaeus, 1764	3				*	*	*		*	*
58	*Hebomoia glaucippe* Linnaeus, 1758	3				*	*	*		*	*
59	*Dercas verhuelli* van der Hoeven, 1839	2		*	*			*	*	*	
60	*Dercas nina* Mellville, 1913	1		*							
61	*Catopsilia pomona* Fabricius, 1775	5a					*				
62	*Catopsilia pyranthe* Linnaeus, 1758	4a				*				*	

	Site		PM	SP 1	SP 2	BH	BN	NH 1	NH 2	BB	MN
	Year		94	94	95	95	95	96	96	96	97
	Season		4	2	1	2	3	1	3	4	1
		gd									
63	*Catopsilia scylla* LINNAEUS, 1763	4a	*								
64	*Eurema ada* DISTANT & PRYER, 1887	3				*			*		
65	*Eurema andersoni* MOORE, 1886	3	*			*	*		*	*	*
66	*Eurema blanda* BOISDUVAL, 1836	3	*				*		*	*	*
67	*Eurema brigitta* STOLL, 1780	4a							*		
68	*Eurema hecabe* LINNAEUS, 1758	4a	*			*	*	*	*	*	*
69	*Eurema laeta* BOISDUVAL, 1836	2							*		*
70	*Eurema novapallida* YATA, 1992	2					*				
71	*Gandaca harina* HORSFIELD, 1819	4a			*					*	
72	*Colias fieldi* MENETRIES, 1855	4b			*						
	Danaidae										
73	*Danaus chrysippus* LINNAEUS, 1758	4a				*	*			*	
74	*Danaus genutia* CRAMER, 1779	4a				*	*	*	*	*	*
75	*Tirumala limniace* CRAMER, 1775	3									*
76	*Tirumala septentrionis* BUTLER, 1874	4a					*	*	*	*	
77	*Parantica aglea* STOLL, 1782	2	*			*	*	*	*	*	*
78	*Parantica melaneus* CRAMER, 1777	3	*					*		*	*
79	*Parantica sita* KOLLAR, 1844	3		*	*			*			*
80	*Ideopsis similis* LINNAEUS, 1758	3					*	*	*	*	
81	*Euploea aglea* GODART, 1819	3	*								
82	*Euploea camaralzeman* BUTLER, 1866	3				*					
83	*Euploea core* CRAMER, 1780	3		*			*			*	
84	*Euploea eunice* GODART, 1819	3								*	
85	*Euploea mulciber* CRAMER, 1777	3	*	*		*	*	*	*	*	*
86	*Euploea radamanthus* FABRICIUS, 1793	3	*			*	*				
87	*Euploea silvester* FABRICIUS, 1793	4a								*	
88	*Euploea tulliolus* FABRICIUS, 1793	4a					*			*	
	Satyridae										
89	*Melanitis leda* LINNAEUS, 1758	5a		*			*		*	*	
90	*Melanitis phedima* CRAMER, 1780	3						*	*	*	*
91	*Melanitis zitenius* HERBST, 1796	3	*					*	*	*	*
92	*Elymnias casiphone* FRUHSTORFER, 1827	3	*								
93	*Elymnias hypermnestra* LINNAEUS, 1763	3					*				
94	*Elymnias malelas ivena* FRUHSTORFER, 1911	3				*				*	*
95	*Lethe chandica* MOORE,, 1858	3				*					

	Site		PM	SP 1	SP 2	BH	BN	NH 1	NH 2	BB	MN
	Year		94	94	95	95	95	96	96	96	97
	Season		4	2	1	2	3	1	3	4	1
		gd									
96	*Lethe confusa* Aurivillius, 1898	3				*		*	*	*	*
97	*Lethe gemina* Leech, 1891	1	*			*					
98	*Lethe insana* Kollar, 1844	3			*						
99	*Lethe mekara* Moore, 1858	3									*
100	*Lethe philemon* Fruhstorfer, 1902	2								*	
101	*Lethe rohria* Fabricius, 1787	3									*
102	*Lethe siderea* Marshall, 1881	2		*							
103	*Lethe sura* Doubleday, 1849	2		*							
104	*Lethe syrcis* Hewitson, 1865	1	*			*					
105	*Lethe verma* Kollar, 1844	3	*	*				*			
106	*Lethe vindhya* C. & R. Felder, 1859	2	*			*					
107	*Neope armandii* Oberthür, 1876	4a				*					
108	*Neope bhadra* Moore, 1858	2				*					
109	*Neope muirheadi* C. & R. Felder, 1862	1						*			
110	*Neope pulaha pulahoides* Moore, 1892	2			*						
111	*Mandarinia regalis baronesa* Fruhst., 1906	1							*	*	
112	*Ethope noirei* Janet, 1896	1	*			*					
113	*Penthema lisarda* Doubleday, 1845	2							*	*	
114	*Mycalesis adamsoni* Watson, 1897	2				*					
115	*Mycalesis anaxias* Hewitson, 1862	3				*	*			*	*
116	*Mycalesis annamitica* Fruhstorfer, 1906	1								*	*
117	*Mycalesis deficiens* Fruhstorfer, 1906	2				*					
118	*Mycalesis francisca* Stoll, 1780	3	*	*							
119	*Mycalesis gotama* Moore, 1858	3				*				*	
120	*Mycalesis inopia* Fruhstorfer, 1908	1	*					*	*	*	
121	*Mycalesis intermedia* Moore, 1892	3					*		*	*	
122	*Mycalesis mineus* Linnaeus, 1758	3				*	*		*	*	*
123	*Mycalesis mnasicles perna* Fruhstorfer, 1906	3									*
124	*Mycalesis perseus* Fabricius, 1775	4a	*				*				
125	*Mycalesis perseoides* Moore, 1892	2						*		*	*
126	*Mycalesis visala* Moore, 1858	2					*				
127	*Mycalesis zonata* Matsumura, 1909	1	*					*	*		
128	*Orsotriaena medus* Fabricius, 1775	4a	*				*	*	*	*	*
129	*Erites falcipennis* Wood-Mason & de Niceville, 1883	2	*			*		*			
130	*Coelites nothis sylvarum* Fruhstorfer,, 1902	1				*			*	*	

	Site		PM	SP 1	SP 2	BH	BN	NH 1	NH 2	BB	MN
	Year		94	94	95	95	95	96	96	96	97
	Season		4	2	1	2	3	1	3	4	1
		gd									
131	*Ragadia crisilda* HEWITSON, 1862	2	*			*	*		*	*	
132	*Ypthima baldus* FABRICIUS, 1775	3	*		*	*	*		*	*	
133	*Ypthima confusa* SHIROZU & SHIMA, 1977	1		*							
134	*Ypthima huebneri* KIRBY, 1871	2				*	*			*	
135	*Ypthima imitans* ELWES & EDWARDS, 1893	1							*		
136	*Ypthima nebulosa* AOKI & UEMURA, 1982 nV	3								*	
137	*Ypthima sakra* MOORE, 1858 nV	2			*						
138	*Ypthima similis* ELWES & EDWARDS, 1893	2							*	*	
139	*Ypthima tappana* MATSUMURA, 1909 nV	1	*			*					
140	*Ypthima* spec. nov.	–			*						
141	*Zipaetis unipupillata* LEE, 1962 nV	5b							*	*	
	Amathusiidae										
142	*Faunis canens* HÜBNER, 1826	2	*				*			*	*
143	*Faunis eumeus* DRURY, 1773	2	*			*	*		*	*	
144	*Aemona amathusa* HEWITSON, 1867	2								*	
145	*Stichophthalma fruhstorferi* RÖBER, 1903	1				*					
146	*Stichophthalma howqua* WESTWOOD, 1851	1							*		
147	*Stichophthalma louisa* WOOD-MASON, 1877	1				*			*		
148	*Thaumantis diores* DOUBLEDAY, 1845	1	*				*		*	*	
149	*Thauria lathyi lathyi* FRUHSTORFER, 1902	1								*	
150	*Discophora deo* DE NICEVILLE, 1898, 2				*	*		*			
151	*Discophora sondaica* BOISDUVAL, 1836	3	*						*		*
152	*Discophora timora* WESTWOOD, 1850	2			*						
	Acraeidae										
153	*Acraea violae* FABRICIUS, 1793	2					*				
154	*Acraea issoria* HÜBNER, 1819	3		*						*	
	Nymphalidae										
155	*Cethosia biblis* DRURY, 1773	3					*		*	*	*
156	*Cethosia cyane* DRURY, 1773	2	*			*	*	*	*	*	
157	*Childrena childreni* GRAY, 1831	4b		*							
158	*Argyreus hyperbius* LINNAEUS, 1763	5a							*	*	
159	*Phalantha alcippe* DRURY, 1773	3								*	
160	*Phalantha phalantha* DRURY, 1773	5a							*		
161	*Cupha eurymanthis* DRURY, 1773	4a	*				*			*	
162	*Vagrans egista* CRAMER, 1780	4a							*	*	

	Site		PM	SP 1	SP 2	BH	BN	NH 1	NH 2	BB	MN
	Year		94	94	95	95	95	96	96	96	97
	Season		4	2	1	2	3	1	3	4	1
		gd									
163	*Cirrochroa aoris* Doubleday, 1848	2								*	
164	*Cirrochroa tyche* Felder, 1861	3	*	*		*			*	*	
165	*Vindula dejone* Butler, 1834	3						*			
166	*Vindula erota* Fabricius, 1793	3	*			*	*	*	*	*	*
167	*Terinos atlita* Fabricius, 1787	3						*		*	
168	*Terinos terpander* Hewitson, 1862	3					*				
169	*Vanessa cardui* Linnaeus, 1758	6			*			*			
170	*Vanessa indica* Herbst, 1794	5a			*					*	
171	*Kaniska canace* Linnaeus, 1763	3			*	*		*		*	*
172	*Polygonia c-aureum* Linnaeus, 1758	3								*	
173	*Symbrenthia hypselis* Godart, 1824	3	*	*	*			*		*	*
174	*Symbrenthia lilaea* Hewitson, 1864	3	*					*		*	*
175	*Junonia almana* Linnaeus, 1758	3	*			*	*	*	*	*	*
176	*Junonia atlites* Linnaeus, 1763	3	*			*	*			*	*
177	*Junonia hierta* Fabricius, 1793	3									*
178	*Junonia iphita* Cramer, 1779	3					*			*	
179	*Junonia lemonias* Linnaeus, 1758	4a					*			*	*
180	*Junonia orithya* Linnaeus, 1758	4a		*						*	*
181	*Rhinopalpa polynice* Cramer, 1779	3	*				*				
182	*Hypolimnas bolina* Linnaeus, 1758	4a		*			*		*	*	
183	*Hypolimnas misippus* Linnaeus, 1764	4a								*	
184	*Doleschallia bisaltide* Cramer, 1777	3	*						*	*	
185	*Kallima inachus* Doyere, 1840	2						*	*	*	
186	*Ariadne ariadne* Linnaeus, 1763	3								*	*
187	*Ariadne merione* Cramer, 1777	3					*				*
188	*Cyrestis cocles* Fabricius, 1787	3		*				*		*	
189	*Cyrestris themire* Honrath, 1884	3								*	*
190	*Cyrestis thyodamus* Doyere, 1840	3	*			*		*		*	*
191	*Chersonesia risa* Doubleday, 1848	3	*			*	*	*		*	*
192	*Neptis clinia* Moore, 1872	3					*				
193	*Neptis harita* Moore, 1875	3						*		*	*
194	*Neptis hylas* Linnaeus, 1758	4a	*			*	*	*		*	*
195	*Neptis leucoporos* Fruhstorfer, 1908	3				*					
196	*Neptis miah* Moore, 1858	2					*	*		*	*
197	*Neptis nata* Moore, 1858	3				*			*	*	*

	Site		PM	SP 1	SP 2	BH	BN	NH 1	NH 2	BB	MN
	Year		94	94	95	95	95	96	96	96	97
	Season		4	2	1	2	3	1	3	4	1
		gd									
198	*Neptis soma* Moore, 1858	3	*	*				*		*	*
199	*Neptis sappho astola* Moore, 1872	2									*
200	*Neptis* spec.	–								*	
201	*Phaedyma columella* Cramer, 1780	4a									*
202	*Pantoporia hordonia* Stoll, 1790	3	*			*	*		*	*	*
203	*Athyma cama* Moore, 1858	3								*	
204	*Athyma perius* Linnaeus, 1758	3								*	
205	*Athyma pravara* Moore, 1858	3	*								
206	*Athyma ranga* Moore, 1858	2						*		*	
207	*Athyma selenophora* Kollar, 1844	3	*			*				*	*
208	*Athyma zeroca* Moore, 1872	2						*			
209	*Sumalia daraxa* Doubleday, 1848	3		*				*			
210	*Moduza procris* Cramer, 1777	3	*				*			*	*
211	*Auzakia danava* Moore, 1858	1		*							
212	*Lebadea martha* Fabricius, 1787	3	*				*				
213	*Parthenos sylvia* Cramer, 1775	4a	*	*	*	*		*	*	*	*
214	*Tanaecia julii* Lesson, 1837	3	*				*		*	*	
215	*Tanaecia lepidea* Butler, 1869	3	*			*	*			*	*
216	*Euthalia anosia* Moore, 1858	3					*				
217	*Euthalia eriphyle* de Niceville, 1891	3								*	
218	*Euthalia evelina* Stoll, 1790	3								*	
219	*Euthalia ?iva* Moore, 1857	2				*					
220	*Euthalia lubentina* Cramer, 1777	3				*					
221	*Euthalia monina* Fabricius, 1778	3									*
222	*Euthalia nara* Moore, 1859	2				*					
223	*Euthalia phemius* Doubleday, 1848	3	*				*				
224	*Euthalia teuta* Doubleday, 1848	3								*	
225	*Lexias dirtea* Fabricius, 1793	3					*				
226	*Lexias pardalis* Moore, 1878	3								*	
227	*Apatura ambica* Kollar, 1844	2								*	
228	*Rohana parisatis* Westwood, 1850	3	*					*	*	*	
229	*Rohana tonkiniana* Fruhstorfer, 1906	1							*		
230	*Herona marathus* Doubleday, 1848	3								*	
231	*Euripus nyctelius* Doubleday, 1845	3	*			*				*	
232	*Hestina nama* Doubleday, 1844	3				*		*		*	*

	Site		PM	SP 1	SP 2	BH	BN	NH 1	NH 2	BB	MN
	Year		94	94	95	95	95	96	96	96	97
	Season		4	2	1	2	3	1	3	4	1
		gd									
233	*Pseudoergolis wedah* Kollar, 1844	2	*					*			*
234	*Stibochiona nicea* Gray, 1846	2						*		*	*
235	*Charaxes aristogiton* Felder, 1867	2	*			*					
236	*Charaxes bernardus* Fabricius, 1793	3								*	
237	*Polyura arja* Felder, 1867	2						*		*	*
238	*Polyura athamas* Drury, 1773	3	*	*		*					
239	*Polyura jalysus* Felder, 1867	3					*				
240	*Prothoe franck* Godart, 1828	3				*					
	Libytheidae										
241	*Libythea celtis* Laicharting, 1782	5b						*		*	
242	*Libythea myrrha* Godart, 1819	3						*			
	Riodinidae										
243	*Zemeros flegyas* Cramer, 1780	3	*	*		*	*	*	*	*	*
244	*Dodona deodata* Hewitson, 1876	1									*
245	*Dodona egeon* Westwood, 1851	3		*							
246	*Dodona ouida* Hewitson, 1866	2		*							
247	*Abisara echerius* Stoll, 1790	3			*	*	*			*	*
248	*Abisara fylla* Doubleday & Hewitson, 1851	2	*			*		*			*
249	*Abisara neophron* Hewitson, 1861	2				*	*			*	*
250	*Paralaxita dora* Fruhstorfer, 1904	1	*			*	*		*		
251	*Stiboges nymphidia* Butler, 1876	3	*		*						

		PM	SP 1	SP 2	BH	BN	NH1	NH2	BB	MN
	Lycaenidae									
252	*Poritia erycinoides* Felder, 1865					*				
253	*Poritia hewitsoni* Moore, 1866									*
254	*Miletus boisduvali* Moore, 1858								*	
255	*Miletus croton* Doherty, 1889				*					
256	*Miletus mallus* Fruhstorfer, 1913									*
257	*Allotinus unicolor* Felder, 1865						*			
258	*Castalius rosimon* Fabricius, 1775					*			*	
259	*Caleta elna* Hewitson, 1876					*				*
260	*Caleta roxus* Godart, 1824						*	*	*	*
261	*Everes lacturnus* Godart, 1824									*
262	*Bothrinia chennelli* de Niceville, 1883								*	

		PM	SP 1	SP 2	BH	BN	NH1	NH2	BB	MN
263	*Pithecops corvus* Fruhstorfer, 1919					*			*	*
264	*Acytolepis puspa* Horsfield, 1828	*			*	*				*
265	*Celastrina lavendularis* Moore, 1877									*
266	*Celastrina argiolus* Linnaeus, 1758	*					*			*
267	*Celastrina marginata* de Niceville, 1884									*
268	*Celastrina* spec.				*				*	
269	*Udara dilecta* Moore, 1879						*			*
270	*Megisba malaya* Horsfield, 1828				*	*				
271	*Zizina otis* Fabricius, 1787					*		*		
272	*Zizeeria karsandra* Moore, 1865									*
273	*Pseudozizeeria maha* Kollar, 1848								*	*
274	*Zizula hylax* Fabricius, 1775				*					*
275	*Chilades pandava* Horsfield, 1829								*	
276	*Catochrysops panormus* Felder, 1860					*				
277	*Lampides boeticus* Linnaeus, 1767	*			*					*
278	*Jamides alceto* Felder, 1860						*	*		
279	*Jamides bochus* Stoll, 1782					*			*	
280	*Jamides celeno* Cramer, 1775	*				*			*	*
281	*Jamides pura* Moore, 1886							*		
282	*Jamides* spec.	*								
283	*Nacaduba kurava* Moore, 1858	*								*
284	*Nacaduba pavana* Horsfield, 1828									*
285	*Prosotas dubiosa* Semper, 1879									*
286	*Prosotas nora* Felder, 1860					*				
287	*Prosotas lutea* Martin, 1895						*			
288	*Prosotas* spec. 1	*			*					
289	*Prosotas* spec. 2							*		
290	*Niphanda asialis* de Niceville, 1895									*
291	*Anthene emolus* Godart, 1824					*		*		
292	*Heliophorus androcles* Hewitson, 1852						*			
293	*Heliophorus brahma* Moore, 1888			*						
294	*Heliophorus epicles* Godart, 1824	*							*	*
295	*Heliophorus hybrida* Tytler, 1912			*						
296	*Heliophorus indicus* Fruhstorfer, 1908				*					
297	*Arhopala pseudocentaurus* Doubleday, 1847					*				
298	*Arhopala* spec. 1	*								
299	*Arhopala* spec. 2				*					
300	*Surendra quercetorum* Moore, 1858	*			*	*				

		PM	SP 1	SP 2	BH	BN	NH1	NH2	BB	MN
301	*Amblipodia anita* Hewitson, 1862					*				
302	*Spindasis syama* Horsfield, 1829					*				*
303	*Catapaecilma major* Druce, 1895									*
304	*Neomyrina nivea* Goodman & Salvin, 1878				*					
305	*Loxura atymnus* Stoll, 1780	*				*			*	
306	*Yasoda androconifera* Fruhstorfer, 1912							*		
307	*Yasoda tripunctata* Hewitson, 1863					*	*		*	
308	*Thamala marciana* Hewitson, 1863.					*				
309	*Cheritra freja* Fabricius, 1793						*			
310	*Ticherra acte* Moore, 1853				*					
311	*Drupadia ravindra* Horsfield, 1828					*				
312	*Pratapa* spec.				*					
313	*Hypolycaena erylus* Godart, 1828					*				
314	*Zeltus amasa* Hewitson, 1865				*	*	*	*	*	*
315	*?Rapala suffusa* Moore, 1879					*				
316	*Curetis bulis* Westwood, 1851	*			*					*
	Hesperiidae									
317	*Celaenorrhinus asmara consertus* de Niceville, 1890				*					
318	*Celaenorrhinus vietnamicus* Devyatkin (in press)	*							*	
319	*Mooreana trichoneura* Felder, 1860	*								
320	*Tagiades gana* Moore, 1866	*								*
321	*Tagiades menaka* Moore, 1866					*			*	
322	*Astictopterus jama* Felder, 1860	*				*				
323	*Notocrypta clavata theba* Evans, 1949 nV	*				*		*	*	
324	*Notocrypta curvifascia curvifascia* C. & R. Felder, 1862				*					*
325	*Notocrypta feisthamelii alysos* Moore, 1866							*		
326	*Notocrypta paralysos asawa* Fruhstorfer, 1911					*			*	
327	*Koruthaialos butleri* de Niceville, 1884 nV							*		
328	*Koruthaialos rubecula hector* Watson, 1893	*				*				
329	*Koruthaialos sindu* Felder, 1860 nV							*		*
330	*Iambrix salsala* Moore, 1866	*				*		*		
331	*Ancistroides nigrita diocles* Moore, 1866 nV							*	*	
332	*Psolos fuligo* Mabberly, 1876					*				
333	*Baoris farri* Moore, 1878	*							*	
334	*Baoris penicillata* Moore, 1881									*
335	*Hasora badra badra* Moore, 1858					*				
336	*Hasora danda* Evans, 1949				*					
337	*Hasora taminatus bhavara* Fruhstorfer, 1911				*					

		PM	SP 1	SP 2	BH	BN	NH1	NH2	BB	MN
338	*Caprona agama agama* Moore, 1858					*				
339	*Pseudocoladenia dan fabia* Evans, 1949 nV						*		*	*
340	*Gerosis phisara* Moore, 1884 nV									*
341	*Arnetta atkinsoni* Moore, 1878						*			*
342	*Aeromachus stigmata* Moore, 1878									*
343	*Ampittia dioscorides camertes* Hewitson, 1868					*				
344	*Ochus subvittatus* Moore, 1878							*		
345	*Pithauria murdava* Moore, 1866							*		
346	*Odontoptilum angulata angulata* Felder, 1862 nV				*				*	
347	*Sebastonyma dolopia* Hewitson, 1868 nV				*					
348	*Thoressa cerata* Hewitson, 1876							*		
349	*Thoressa masoni* Moore, 1879							*		
350	*Thoressa monastyrskyi* Devyatkin, 1996 nV				*					
351	*Halpe gamma* Evans, 1937 nV				*					
352	*Halpe wantona* Swinhoe, 1893 nV									*
353	*Halpe zema* Hewitson, 1877							*		
354	*Halpe* spec.									*
355	*Isoteinon lamprospilus formosanus* Fruhst., 1910				*			*		
356	*Pyroneura margherita miriam* Evans, 1941 nV					*				
357	*Lotongus calathus* Hewitson, 1876					*				
358	*Matapa druna* Moore, 1866					*			*	*
359	*Matapa* spec. (or *druna* var.)									*
360	*Potanthus ganda ganda* Fruhstorfer, 1911				*					*
361	*Potanthus nesta* Evans, 1934			*						*
362	*Potanthus pava* Fruhstorfer, 1911									*
363	*Telicota besta* Evans, 1949						*			
364	*Telicota linna* Evans, 1949									*
365	*Cephrenas chrysozona oceanica* Mabille, 1904									*
366	*Borbo bevani* Moore, 1878									*
367	*Oriens gola pseudolus* Mabille, 1883					*				
368	*Polytremis discreta* Elwes & Edwards, 1898									*
369	*Polytremis lubricans* Herrich-Schäffer, 1869					*		*	*	*
370	*Pelopidas agna* Moore, 1866					*			*	
371	*Pelopidas conjuncta* Herrich-Schäffer, 1869								*	
372	*Parnana apostata* Snellen, 1886								*	
373	*Parnana bada* Moore, 1878								*	
374	*Parnana ganga* Evans, 1937				*					
375	*Parnana guttata* Bremer & Grey, 1853							*		

		PM	SP 1	SP 2	BH	BN	NH1	NH2	BB	MN
376	*Udaspes folus* Cramer, 1775								*	
377	*Erionota torus* Evans, 1941								*	
378	*Scobura isota* Swinhoe, 1893								*	*
379	*Caltoris kumara moorei* Evans, 1926								*	
380	*Caltoris tulsi* de Niceville, 1884								*	
381	*Caltoris confusa* Evans, 1932									*
382	*Caltoris cahira austeni* Moore, 1884								*	
383	*Caltoris* spec.									*

addresses of the authors:

M. J. Hill
Fauna and Flora International
Cuc Phuong National Park
Nho Quan District
Ninh Binh Province, Vietnam.

A. L. Monastyrskii
Vietnam-Russia Tropical Centre
Hanoi, Vietnam.